

What is claimed is:

1. Apparatus for modeling and evaluating the characteristics of three-dimensional forms which comprises, in combination,
 - a deformable material that may be manually shaped to define a surface,
 - means for measuring the position of said surface to produced surface geometry data,
 - means for processing said surface geometry data to generate result data which specifies one or more characteristics of said surface at different points on or near said surface, and
 - means for projecting an image corresponding to said result data onto said surface.
2. Apparatus for modeling and evaluating the characteristics of three-dimensional forms as set forth in claim 1 wherein said deformable material is supported on a rotatable turntable.
3. Apparatus for modeling and evaluating the characteristics of three-dimensional forms as set forth in claim 1 wherein said deformable material is selected from a group consisting of clay, putty, plasticine, beads, and rectilinear blocks.
4. Apparatus for modeling and evaluating the characteristics of three-dimensional forms as set forth in claim 1 wherein said deformable material is a plastic material that can be shaped and once shaped retains its shape.
5. Apparatus for modeling and evaluating the characteristics of three-dimensional forms as set forth in claim 1 wherein said means for measuring is a three-dimensional optical distance measuring device.
6. Apparatus for modeling and evaluating the characteristics of three-dimensional forms as set forth in claim 1 wherein said means for measuring is a laser scanner.
7. Apparatus for modeling and evaluating the characteristics of three-dimensional forms as set forth in claim 6 wherein said laser scanner is a triangulation based laser scanner that includes

means for directing laser light at different positions on said surface and means for converting reflected laser light from said surface into said surface geometry data.

8. Apparatus for modeling and evaluating the characteristics of three-dimensional forms as set forth in claim 6 wherein said means for projecting an image corresponding to said result data is located at the same optical origin as said laser scanner.

9. Apparatus for modeling and evaluating the characteristics of three-dimensional forms as set forth in claim 8 further including a coated mirror through which said laser scanner illuminates said surface and which reflects said image from said projector onto said surface so that said laser scanner and said means for projecting have the same optical origin.

10. Apparatus for modeling and evaluating the characteristics of three-dimensional forms as set forth in claim 1 wherein said means for measuring the position of said surface operates repeatedly to remeasure the position of said surface to provide said surface geometry data in real time as said deformable material is reshaped or moved.

11. Apparatus for modeling and evaluating the characteristics of three-dimensional forms as set forth in claim 10 wherein said means for processing generates changing result data in real time as said surface geometry is reshaped or moved, and said means for projecting an image is a video projector that displays a changing image corresponding to said changing result data.

12. Apparatus for modeling and evaluating the characteristics of three-dimensional forms as set forth in claim 1 wherein said means for processing said surface data comprises means for translating said surface geometry data into a standard geometry format and means for selecting and executing an analysis routine from a library of available analysis routines for processing said data in said standard geometry format to generate said result data.

13. Apparatus for modeling and evaluating the characteristics of three-dimensional forms as set forth in claim 12 wherein said means for processing further comprises means for representing said result data in a standard graphical display format and for thereafter processing said result data

in said standard graphical display format into image data supplied to said means for projecting an image corresponding to said result data onto said surface.

14. Apparatus for modeling and evaluating the characteristics of three-dimensional forms as set forth in claim 12 wherein means for processing includes means for generating different sets of result data using corresponding ones of said available analysis routines, and wherein said means for projecting projects a plurality of images concurrently, each of which corresponds to one of said sets of result data, whereby a user can simultaneously view different characteristics of said surface.

15. Apparatus for modeling and evaluating the characteristics of three-dimensional forms as set forth in claim 1 wherein said means for processing further comprises means for representing said result data in a standard graphical display format and for thereafter processing said result data in said standard graphical display format into image data supplied to said means for projecting an image corresponding to said result data onto said surface.

16. Apparatus for modeling and evaluating the characteristics of three-dimensional forms as set forth in claim 1 wherein said surface geometry data comprises an array of values each of which specifies the elevation of said surface at a particular location in two-dimensional array of locations.

17. Apparatus for modeling and evaluating the characteristics of three-dimensional forms as set forth in claim 16 is conforms to the Digital Elevation Model for representing topographical data.

18. Apparatus for modeling and evaluating the characteristics of three-dimensional forms as set forth in claim 17 wherein said means for processing said surface geometry data comprises means for selecting and executing a routine in a library of routines for processing DEM data into result data.

19. Apparatus for modeling and evaluating the characteristics of three-dimensional forms as set forth in claim 18 wherein said surface is a topological landscape surface and wherein said

library includes for generating result data which specifies characteristics of said surface selected from a group consisting of: slope, curvature, shadowing, solar radiation, field of view, cost of passage, water flow and land erosion characteristics.

20. Apparatus for modeling and evaluating the characteristics of three-dimensional forms as set forth in claim 1 further comprising means for storing said result data as a voxel dataset representing the characteristics of said surface and a three dimensional region surrounding said surface, means for measuring the position of a second surface, and means for projecting an image corresponding to a selected portion of said voxel dataset defined by the position of said second surface relative to said first surface.